

CLAIMS

1. A water treatment system comprising:
a water reservoir fluidly connected to a point of entry;
5 an electrochemical device fluidly connected to the water reservoir and comprising a compartment that is at least partially filled with electroactive media and bounded by anion-selective membranes on each side thereof; and
a water distribution system fluidly connected to at least one of the water reservoir and the electrochemical device.
- 10 2. The water treatment system of claim 1 further comprising a point of use fluidly connected to the water distribution system.
3. The water treatment system of claim 1 further comprising a sensor measuring at least
15 one operating parameter of the water treatment system.
4. The water treatment system of claim 1 wherein the water reservoir is pressurized.
5. The water treatment system of claim 1 further comprising a circulation system
20 fluidly connected to a concentrating compartment of the electrochemical device.
6. The electrochemical device of claim 1 wherein the electroactive media comprises cation-exchange resin.
- 25 7. The electrochemical device of claim 1 wherein the electroactive media comprises ion-exchange fiber.
8. An electrochemical device comprising an ion-trapping compartment comprising cation-exchange resin and anion-selective membranes.
- 30 9. The electrochemical device of claim 8 further comprising an anode compartment fluidly connected downstream of the ion-trapping compartment.

10. The electrochemical device of claim 9 further comprising a diluting compartment positioned between the ion-trapping compartment and the anode compartment.
11. The electrochemical device of claim 10 further comprising an alkaline-collecting
5 compartment positioned adjacent to the ion-trapping compartment.
12. The electrochemical device of claim 11 further comprising a second diluting compartment positioned adjacent to the collecting compartment.
- 10 13. The electrochemical device of claim 12 further comprising a concentrating compartment positioned adjacent to the second diluting compartment.
14. The electrochemical device of claim 13 further comprising a mixture of anion-exchange resin and cation-exchange resin that at least partially fills at least one of the
15 diluting, concentrating, collecting and anode compartments.
15. An electrochemical device comprising a compartment comprising electroactive media that is substantially free of anion-exchange resin and is bounded by anion-selective membranes on each side thereof.
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16. An electrochemical device comprising a compartment consisting essentially of cation-exchange resin and anion-selective membranes.
17. An electrochemical device comprising a compartment that is constructed and
25 arranged to inhibit the migration of cations while promoting the migration of anions to an adjacent compartment.
18. An electrochemical device comprising:
a first depleting compartment;
30 an ion-trapping compartment comprising cation-exchange resin adjacent the first depleting compartment;
an alkaline-collecting compartment positioned adjacent the ion-trapping compartment; and

a second depleting compartment positioned adjacent the alkaline-collecting compartment.

19. The electrochemical device of claim 18 further comprising an anode compartment
5 fluidly connected to the ion-trapping compartment.

20. The electrochemical device of claim 18 further comprising an anion-selective membrane separating the first depleting compartment and the ion-trapping compartment.

10 21. The electrochemical device of claim 18 further comprising an anion-selective membrane separating the ion-trapping compartment and the alkaline-collecting compartment.

22. An electrochemical device comprising a depleting compartment and a concentrating
15 compartment, at least one of the depleting and concentrating compartments comprising electroactive fiber felt.

23. The electrochemical device of claim 22 wherein the electroactive fiber felt comprises weakly ionized species in a polymer binder.

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24. A method of treating a liquid comprising
providing an electrochemical device comprising a depleting compartment, a
concentrating compartment and an ion-trapping compartment disposed between the
depleting and the concentrating compartments;
25 passing the liquid to be treated through the depleting compartment; and
collecting hydrogen ions in the ion-trapping compartment.

25. The method of claim 24 further comprising the step of transferring at least a portion
of the hydrogen ions into an electrode compartment of the electrochemical device.

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26. The method of claim 24 further comprising the step of promoting at least a portion of
the hydroxyl ions to migrate from the ion-trapping compartment.

27. A method of treating water comprising:
providing an electrochemical device comprising a compartment bounded by an ion-selective membrane and an electrode compartment;
introducing water into the compartment;
5 dissociating water into hydrogen and hydroxyl ions in the compartment; and
transferring at least a portion of the hydrogen ions to the electrode compartment.

28. The method of claim 27 further comprising the step of allowing at least a portion of the hydroxyl ions to migrate through the ion-selective membrane.

29. The method of claim 28 further comprising the step of inhibiting at least a portion of the hydrogen ions from migrating through the ion-selective membrane.

30. The method of claim 27 wherein the compartment is at least partially filled with
15 cation-exchange resin.

31. A method of facilitating liquid treatment comprising providing an electrochemical device comprising at least one compartment that is at least partially filled with cation-exchange resin and bounded by anion-selective membranes on each side thereof.

32. A method of facilitating liquid treatment comprising providing an electrochemical device comprising a compartment consisting essentially of cation-exchange resin and anion-selective membranes.